

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference DW/RM/00090WO	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/GB 01/ 03437	International filing date (<i>day/month/year</i>) 31/07/2001	(Earliest) Priority Date (<i>day/month/year</i>) 01/08/2000
Applicant RIPMAX PLC		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
 - contained in the international application in written form.
 - filed together with the international application in computer readable form.
 - furnished subsequently to this Authority in written form.
 - furnished subsequently to this Authority in computer readable form.
 - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
 - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. **Certain claims were found unsearchable** (See Box I).

3. **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

1

None of the figures.

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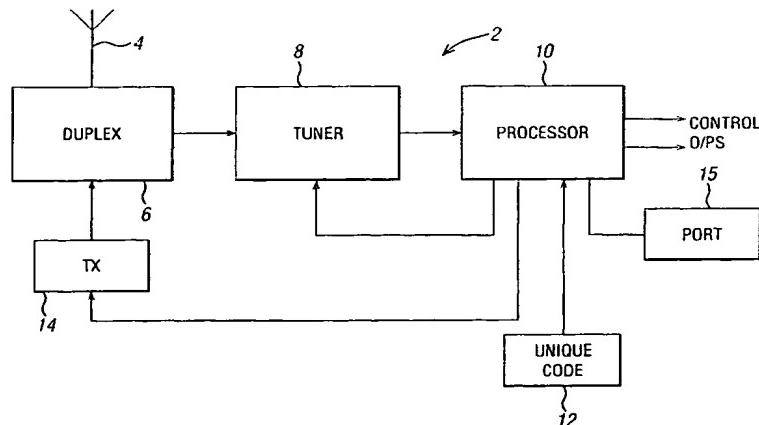
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Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: RADIO CONTROL TRANSMITTER AND RECEIVER



WO 02/11097 A1

(57) Abstract: Radio control is used for different types of models, e.g. aircraft, cars and boats. Commonly, a number of different radio channels are allocated in a frequency band for use in radio control. If a modeller finds her or his intended channel in use, s/he can either wait until it becomes free, or retune the transmitter and receiver to a channel which is not in use. This can involve changing two crystals, one of which, in the receiver, may involve partly disassembling the model. A radio control receiver is disclosed having data storage containing code unique to the receiver. The receiver has a tuner arranged to scan a plurality of radio channels. A processor is arranged to process receiver identifying code received on a channel, with the unique code to determine whether transmissions on the channel are intended for the receiver. The tuner is responsive to an output from the processor indicating that transmissions on the channel are intended for the receiver, to lock onto that channel, and to the output from the tuner indicating that the transmissions on that channel are not intended for the receiver, to tune to another of the plurality of radio channels. Having ascertained that a channel is free, the modeller tunes her or his transmitter, switches that on and switches on the receiver. The latter identifies the channel and locks on to it."

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RADIO CONTROL TRANSMITTER AND RECEIVER

This invention relates to radio control transmitters and receivers.

Radio control is used for different types of models, e.g. aircraft, cars and boats.

Commonly, a number of different radio channels are allocated in a frequency band for
5 use in radio control. A common feature to the practice of radio control is that the channel, to which a receiver is tuned, is set by a replaceable crystal. The channel to which a radio control transmitter is tuned is also commonly set by a replaceable crystal.

Before commencing to transmit a modeller has to check whether the channel to which
her or his transmitter and receiver are tuned is in use by some one else. There are
10 systems for allowing such checks including flying indicative pennants on or near the transmitter, and pegboards on which a modeller indicates the use of a channel. If a modeller finds her or his intended channel in use, s/he can either wait until it becomes free, or retune the transmitter and receiver to a channel which is not in use. This can involve changing two crystals, one of which, in the receiver, may involve partly
15 disassembling the model.

Against this background the invention provides a radio control receiver for operating a plurality of devices each on a respective device channel, the receiver having data storage containing code unique to the receiver, a tuner arranged to scan a plurality of radio channels, and a processor for processing receiver identifying code received on a
20 channel, with the unique code to determine whether transmissions on the channel are intended for the receiver, said tuner being responsive to an output from the processor indicating that transmissions on the channel are intended for the receiver, to lock onto that channel, and to the output from the tuner indicating that the transmissions on that channel are not intended for the receiver, to tune to another of the plurality of radio
25 channels. Having ascertained that a channel is free, the modeller tunes her or his transmitter, switches that on and switches on the receiver. The latter identifies the channel and locks on to it.

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The unique code is preferably processed with received code periodically, in one example each time a set of failsafe information is received. In another example the unique code is processed with received code each time a frame of data for a set of device channels is received.

5 To simplify setting up the transmitter, the unique code is preferably interrogable at a communication port. In a simple example, the unique code is the serial number of the receiver and this is displayed externally on the receiver.

In one preferred example, the receiver is part of a transceiver equipped to transmit signals indicating poor reception.

10 In one simple effective arrangement, the processor is operative to compare the received code with the unique code and to give an output indicating that the transmissions on the channel are intended for the receiver when the compared code are identical, and otherwise to indicate that the transmissions on that channel are not intended for the receiver.

15 The invention also extends to a radio control transmitter for transmitting signals to a receiver in accordance with the invention, so as to operate a plurality of devices each on a respective device channel, the transmitter having data storage for storing codes which when processed with a corresponding unique code indicate that transmissions are intended for the receiver, an input device for setting codes in the data store and for
20 selecting codes for transmission, and a processor for transmitting control data and a selected code on the same radio channel. If the modeller intends to use the transmitter with more than one model, then before transmissions are effective, the correct code must be selected. This may be stored as part of other set up information for the model, control throws, for example, so that provided each model has its own receiver, selecting
25 the wrong model by mistake will not operate the intended model with the wrong set up information.

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One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figure 1 is a block diagram of a radio control receiver embodying the invention;
- Figure 2 is a block diagram of a radio control transmitter embodying the invention;
- 5 Figure 3 is a schematic showing an example of signals exchanged between the transmitter of Figure 2 and the receiver of Figure 1; and
- Figure 4 is a schematic showing another example of signals exchanged between the transmitter of Figure 2 and the receiver of Figure 1.

Referring to the drawings, the radio control receiver 2 shown in Figure 1 has an antenna 4 coupled to a duplexer 6. Signals received by the antenna 4 are coupled through the duplexer 6 to a scanning frequency synthesising tuner 8. When switched on, the tuner 8 is operative to tune to a selected channel in a set of channels contained by a frequency band assigned to radio control. The selected channel may be predetermined, e.g. the last used by the receiver, or may be random. Signals received 10 on the tuned channel are sent from the tuner to a processor 10. This processes the received signals to see if it can find code identifying itself. To do this it retrieves a unique code by which it is identified from a data store 12 and looks for corresponding code in the received signals. The data store 12 may be in any convenient form, e.g. read only memory, hard-wired links, dual in line switches etc. The received signals and the unique 15 code are processed, in one example, by comparing one with the other. If code is identified in the received signals, which is identical to the unique code, a signal is output from the processor to the tuner to lock onto the channel. The processor also begins outputting control signals to devices to be controlled on separate device control 20 channels.

25 If the processor does not identify code corresponding to the unique code, the signal output to the tuner instructs it to tune to another channel and the process is

repeated. The channels are selected one after another until received code corresponding to the unique code is found.

The processor is also arranged to assess the quality of the received signals.

- Conventionally, the received signals contain check digits. The bit error rate is
- 5 determined by the processor from these and if the rate is too high, a signal is sent to a transmitter 14 coupled to the duplexer 6 by which the radio control transmitter 16 (Figure 2) is instructed to use another channel. This causes loss of the corresponding code from the signals received by the receiver 2. The outputs to the control devices are now changed to fail safe settings, which may have been stored in the data store 12 and the
- 10 tuner is instructed to change channels until a channel containing the corresponding code is found.

In order to simplify setting up a transmitter to use with the receiver, it may have a port 15, e.g. an infrared communications port, USB port etc by which it may be interrogated to determine the unique code.

- 15 Referring to Figure 2, the radio control transmitter 16 has a processor 18. In common with conventional (computer) transmitters, it also has a store 20 in which model set up information is stored with a model identity. This may not be unique, for example, being the name of the model type e.g. "tiger moth". Commonly, the store is used to store the set up information for a plurality of models, the data being used to set, say, control
- 20 throws and directions and being retrieved by selecting the model's identity.

Along with this information, for each model there is stored a code corresponding to the unique code of the model's particular receiver for that user. This may be the same as the unique code or not depending on the way the receiver processes the information.

- The transmitter has a number of input devices 22, usually including joysticks and
- 25 switches, and a display screen 24 on which information may be presented to the user, e.g. model identity. Use of the input devices enables a model to be selected. Selection of a particular model causes the processor 18 to adopt the set up appropriate for the

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model and to send control information determined by the input devices, together with code corresponding to the receiver's unique code for the selected model, to a tuner 26. The processor also indicates to the tuner what channel to use, this may be set by use of the input devices 22 and display 24. The tuner sends to control and corresponding 5 code, in the selected radio channel, via a duplexer 28 to an antenna 30.

In an alternative, a receiver 32 may scan channels in the radio control frequency band to determine an idle channel and communicate that to the processor.

An indication of poor reception from the transmitter 14 is sent by the receiver 32 to the processor, which selects another channel from any that are idle.

10 In another alternative, the receiver 32 is periodically tuned to the channel in use by the transmitter. Transmission is ceased while the receiver determines if there is interference on the channel in use. If there is significant interference, the tuner 26 is retuned to another, idle, channel.

Referring to Figure 3, the format of the signals exchanged between the transmitter 15 16 and the receiver 2 is a repeated frame 34. Each frame 34 contains control data for, say 10 device channels 36, and check data 38 from which the quality of the received signals can be determined. In some examples, an error correcting code is used.

At regular intervals of N frames, fail-safe information 40 is sent containing positions to which the control devices are set if contact with the transmitter 16 is lost. At these 20 intervals, the code 42 corresponding to the receiver's unique code is also sent.

In another arrangement shown in Figure 4, the code 42 is sent in each frame, e.g. after the check digits 38.

CLAIMS

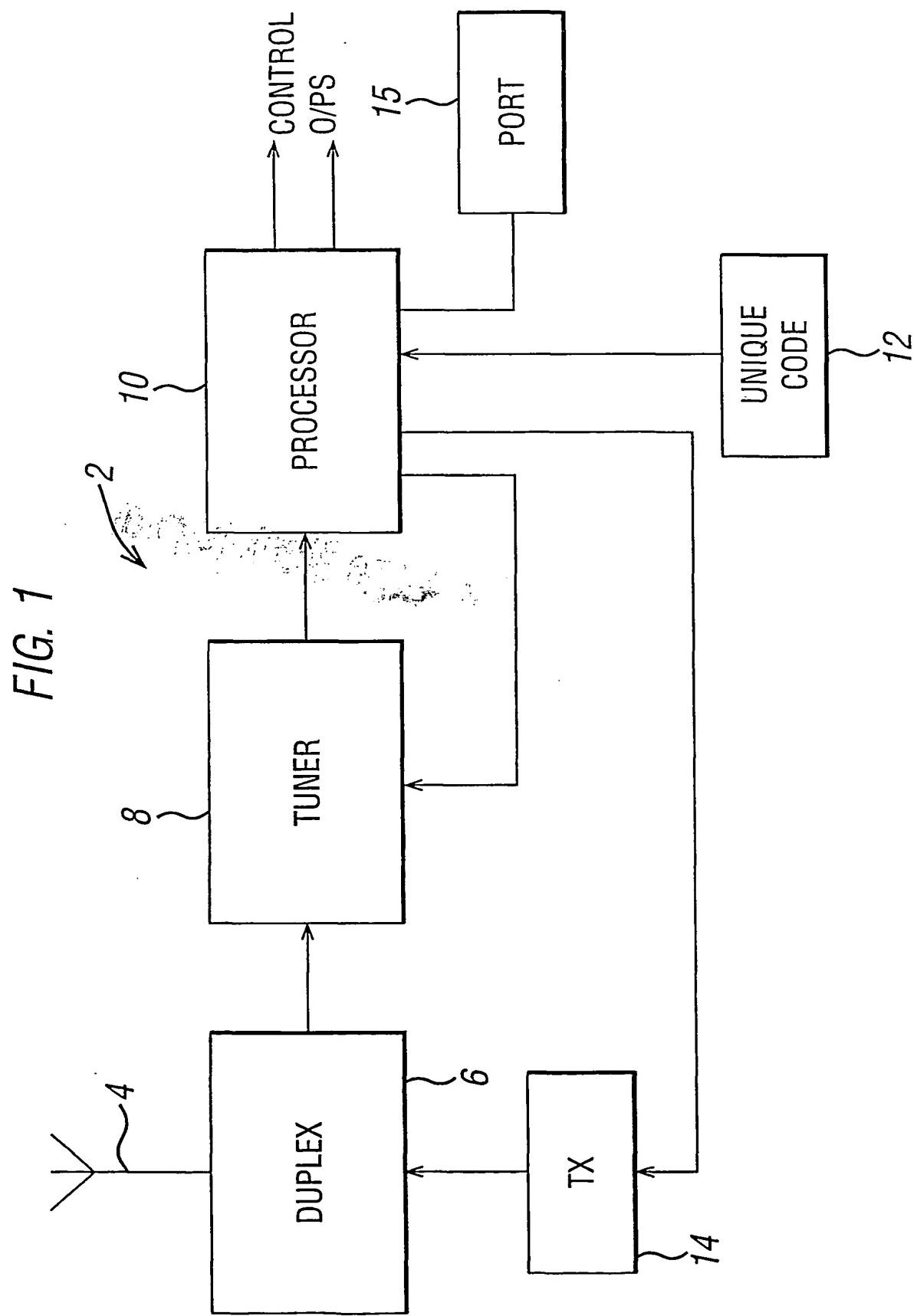
1. A radio control receiver for operating a plurality of devices each on a respective device channel, the receiver having data storage containing code unique to the receiver, a tuner arranged to scan a plurality of radio channels, and a processor for processing receiver identifying code received on a channel, with the unique code to determine whether transmissions on the channel are intended for the receiver, said tuner being responsive to an output from the processor indicating that transmissions on the channel are intended for the receiver, to lock onto that channel, and to the output from the tuner indicating that the transmissions on that channel are not intended for the receiver, to tune to another of the plurality of radio channels.
2. A receiver as claimed in claim 1, wherein the unique code is processed with received code periodically.
3. A receiver as claimed in claim 2, wherein the unique code is processed with received code each time a set of failsafe information is received.
4. A receiver as claimed in claim 2, wherein the unique code is processed with received code each time a frame of data for a set of device channels is received.
5. A receiver as claimed in any preceding claim, wherein the unique code is interrogable at a communication port.
- 20 6. A receiver as claimed in any preceding claim wherein the receiver is part of a transceiver equipped to transmit signals indicating poor reception.
7. A receiver as claimed in any preceding claim, wherein the processor is operative to compare the received code with the unique code and to give an output indicating that the transmissions on the channel are intended for the receiver when the compared code are identical, and otherwise to indicate that the transmissions on that channel are not intended for the receiver.

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8. A radio control transmitter for transmitting signals to a receiver as claimed in claim 1, so as to operate a plurality of devices each on a respective device channel, the transmitter having data storage for storing codes which when processed with a corresponding unique code indicate that transmissions are intended for the receiver, an input device for setting codes in the data store and for selecting codes for transmission, and a processor for transmitting control data and a selected code on the same radio channel.
9. A transmitter as claimed in claim 8, wherein the selected code is transmitted periodically.
10. A transmitter as claimed in claim 9, wherein the selected code is transmitted each time a set of failsafe information is transmitted.
11. A transmitter as claimed in claim 9, wherein the selected code is transmitted each time a frame of data for a set of device channels is transmitted.
12. A transmitter as claimed in any of claims 8 to 11, wherein input device includes means for interrogating a communication port of the receiver.
13. A transmitter as claimed in any of claims 8 to 12, which is part of a transceiver equipped to receive signals indicating poor reception from the receiver and to change channels in response to receipt of such signals.
14. A transmitter as claimed in any of claims 8 to 12, which is part of a transceiver equipped to receive signals on the channel in use by the transmitter, the transceiver being arranged to cease transmission periodically and then to change the channel in the event that significant interference is received on the channel in use.
A transmitter as claimed in any of claims 8 to 13, wherein the stored code is identical to the unique code.

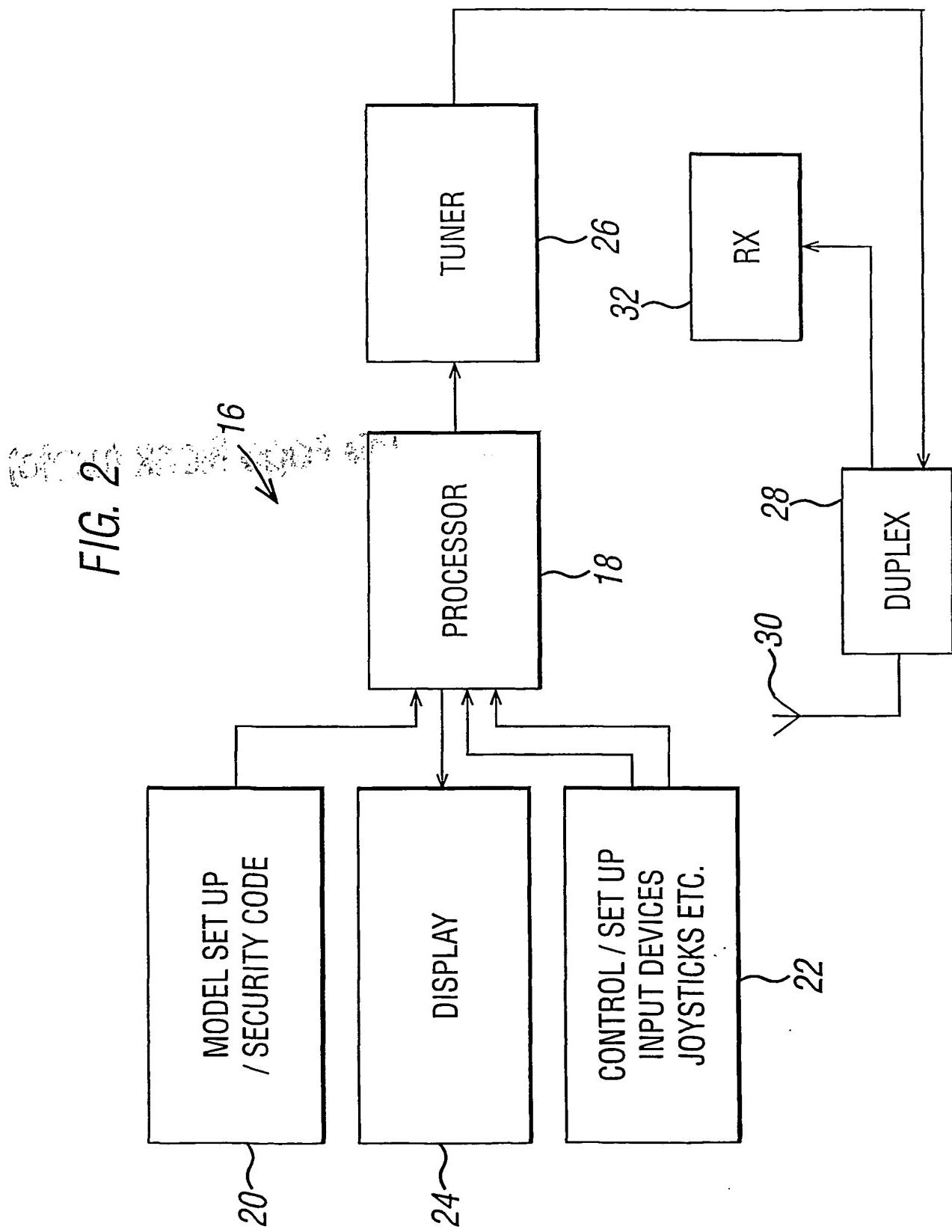
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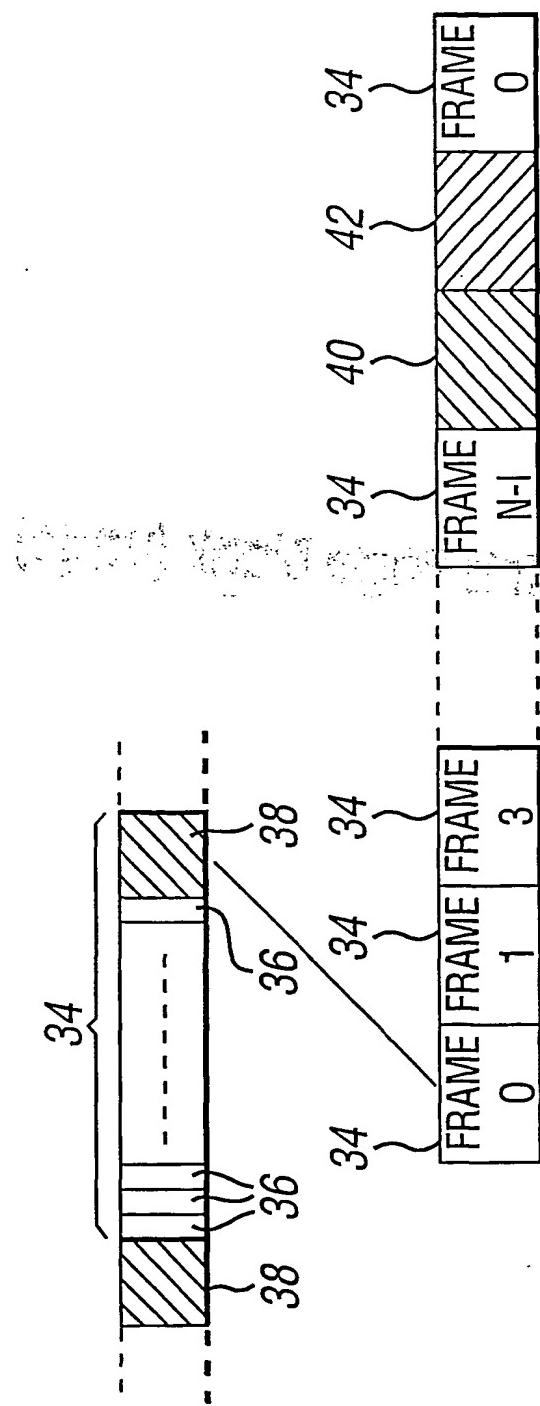


FIG. 3

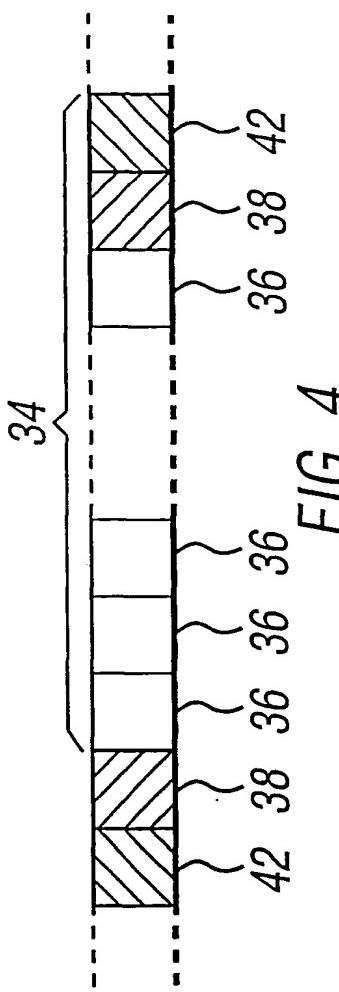


FIG. 4

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/03437

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08C17/02 A63H30/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G08C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 93 19 508 U (HETRONIC STEUERSYSTEME GMBH) 17 February 1994 (1994-02-17) page 4, line 21 -page 6, line 7 ---	1,2,4, 7-9,11, 14,15
X	DE 195 02 839 C (BRENDEL WOLFGANG DIPL ING) 5 June 1996 (1996-06-05) column 4, line 3 - line 68 ---	1,2,4, 7-9,11, 15
X	US 5 499 388 A (SONG BYUNG M) 12 March 1996 (1996-03-12) column 5, line 24 -column 6, line 51 column 7, line 62 -column 8, line 65 column 10, line 21 -column 11, line 3 ---	1,7,8,15
A	column 5, line 24 -column 6, line 51 column 7, line 62 -column 8, line 65 column 10, line 21 -column 11, line 3 ---	5,12,14
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
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- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

27 November 2001

Date of mailing of the international search report

04/12/2001

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INTERNATIONAL SEARCH REPORTInternational Application No
PCT/GB 01/03437**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 197 05 502 A (BRENDEL WOLFGANG) 20 August 1998 (1998-08-20) column 4, line 54 -column 5, line 51 column 6, line 17 -column 8, line 3 -----	1,2,4, 6-9,11, 13-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 01/03437

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
DE 9319508	U	17-02-1994	DE	9319508 U1		17-02-1994
DE 19502839	C	05-06-1996	DE	19502839 C1		05-06-1996
US 5499388	A	12-03-1996	NONE			
DE 19705502	A	20-08-1998	DE	19705502 A1		20-08-1998

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